

Geel 2000 Language Schools

Science Department

Third Preparatory

Second term

(2023/2024)

Name:..

Class:...

Revision

The chemical symbol of some elements

Element	Symbol	Element	symbol
Hydrogen	H	Helium	He
Potassium	K	Calcium	Ca
Oxygen	O	Fluorine	F
Bromine	Br	Silver	Ag
Aluminium	Al	Silicon	Si
Chlorine	Cl	Boron	B
Lead	Pb	Argon	Ar
Carbon	C	Nitrogen	N
Copper	Cu	Zinc	Zn
Sodium	Na	Magnesium	Mg
Gold	Au	Mercury	Hg
Sulphur	S	Berylium	Be
Lithium	Li	Iron	Fe
Neon	Ne	Iodine	I
Phosphorus	P	Chromium	Cr

Valency:

It is the number of electrons that an atom gains, loses or even shares during a chemical reaction.

Element	Type	Valency
Lithium **Li** Potassium **K** Sodium **Na** Silver **Ag**	**Metallic elements**	**Monovalent (1)**
Hydrogen **H** Fluorine **F** Iodine **I** Bromine **Br** Chlorine **Cl**	**Nonmetallic elements**	**Monovalent (1)**
Calcium **Ca** Lead **Pb** Zinc **Zn** Magnesium **Mg** Mercury **Hg**	**Metallic elements**	**Divalent (2)**
Oxygen **O**	**Nonmetallic elements**	**Divalent (2)**
Aluminium **Al** Gold **Au**	**Metallic elements**	**Trivalent (3)**
Carbon **C**	**Nonmetallic element**	**Tetravalent (4)**

There are some elements which have more than one valency such as:

Element	Type	Valency
Copper cu	Metal	Copper monovalent Copper Divalent
Iron Fe	Metal	Iron (Ferrous Fe^{+2}) Divalent Iron (Ferric Fe^{+3}) trivalent
Sulphur S	Nonmetal	Divalent (2) Tetravalent (4) Hexavalent(6)
Nitrogen N	Nonmetal	Trivalent (3) Pentavalent (5)
Phosphorus P	Nonmetal	Trivalent (3) Pentavalent (5)

Hydroxide	OH^-	1	Sulphate	SO_4^{-2}	2
Nitrate	No^-_3	1	Carbonate	CO_3^{-2}	2
Bicarbonate	HCO^-_3	1	Phosphate	PO_4^{-3}	3
Ammonium	NH^+_4	1			
Nitrite	NO^-_2	1			

Chemical formula:

It is a formula that represents the numbers and types of the atoms in a molecule.

How to write the chemical formula for a compound?

1. Write the name of the compound in words.

2 .Write the symbol of each element or atomic group down to the name.

3. Write the valency down to each symbol.

4 .All the numbers are to be shortened as much as you can.

5.Replace the written numbers (You don't have to write the one (1)

6.In case of atomic atomic groups, if the number was not (1) put it between parenthesis and write the number right down to it.

Examples: **Sodium Chloride**

Na Cl

1 1 (NaCl)

Calcium oxide , **Copper carbonate ,** **Aluminium sulphate**

Ca **O** **Cu** **Co_3** **Al** **SO_3**

2 2 2 2 3 2

1 1 1 1 2 3

CaO $CuCo_3$ $Al_2(SO_4)_3$

Types of compounds according to their **properties**:

1) Acids 2) Bases (Alkalies) 3) Oxids 4) Salts

Acids: they are substances which dissociate in water producing positive hydrogen ions (H^+).

Examples:

Hydrochloride Acid	**HCl**
Sulphuric Acid	H_2SO_4
Nitric Acid	HNO_3

2.Bases

They are compounds that produce negative hydroxide ions(OH^-) when decomposed in water.

Examples:

Sodium Hydroxide (caustic soda)	**Na OH**
Potassium Hydroxide	**KOH**
Calcium Hydroxide (limewater)	$Ca(OH)_2$

Oxids: Types are compounds resulted from the combination between oxygen and an element even though it is a metal or nonmetal.

Examples:

Metal oxides

Sodium oxide Na_2O
Calcium oxide CaO
Aluminum oxide Al_2O_3

Nonmetal oxides

Carbon dioxide CO_2
Sulphur trioxide SO_3

4- Salts:

Are produced as a result of the chemical combination of a positive metal ion or a positive atomic group with a negative atomic group or a negative ion (except oxygen).

Salts are produced from the combination of

Positive

Positive

Negative Nonmetal ion

Negative atomic group

Ex:	EX:
Sodium chloride (table salt) NaCl Lead bromine $PbBr_2$	Sodium nitrate $NaNO_3$ Magnesium carbonate $MgCO_3$ Unhydrous copper sulphate $CuSO_4$

Negative nonmetal ion

Negative atomic group

Ex:	Ex:
Ammonium chloride NH_4Cl Ammonium bromide NH_4Br	Ammonium carbonate $(NH_4)_2CO_3$ Ammonium nitrate NH_4NO_3

Unit (1): Chemical reactions

Lesson (1): chemical reactions

Chemical reaction:

Breaking up of bonds in the reactants and formation new bonds in the products (resultants) molecules from the reaction.

Types of chemical reactions:

1- Thermal decomposition reaction.

2- Substitution reaction

3- Oxidation and reduction

1 Thermal decomposition reactions:

- The breaking up of compounds into simple one by heat.
-

Examples:

1-Thermal decomposition of metal hydroxides.

Metal hydroxide decomposes by heat into metal oxide and water vapor.

$Cu(OH)_2$ CuO + H_2O

Copper hydroxide (Blue color)   copper oxide (Black color)

2-Thermal decomposition of metal carbonate

Metal carbonates decomposes by heat into metal oxide and carbon dioxide.

$$CuCO_3 \xrightarrow{\Delta} CuO + CO_2\uparrow$$

Copper carbonate (green color) *copper oxide (Black color)*

3-Thermal decomposition of metal sulphate.

Metal sulphate decomposes by heat into metal oxide and sulphur trioxide.

$$CuSO_4 \xrightarrow{\Delta} CuO + SO_3.\uparrow$$

Copper sulphate (Blue color) *copper oxide (Black color)*

4-Thermal decomposition of some metal oxides.

Metal oxide decomposes by heat into metal and oxygen gases evolves

$$2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$$

mercuric oxide (red color) mercury (silver ppt.)

5-Thermal decomposition of metal nitrate

Metal nitrate decomposes by heat forming metal nitrate and oxygen gases evolves

$$2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2\uparrow$$

Sodium nitrate (white) sodium nitrite (yellowish white)

Science technology: AIR BAGS

- They are very important in cars as a safety mean in emergencies.
- Rapid decomposition occur in crashes to sodium azid forming sodium metal and nitrogen gas evolving.

$$2\,NaN_3 \xrightarrow[\text{spark}]{\text{electric}} 2\,Na + 3\,N_2$$

*The air bags gets flated at an extreme speed ,then it gets vacuumed rapidly to ensure

1- clear vision 2- proper movement for the driver

❷ *Substitution reactions:*

*Chemical reaction where the element which more active substitute (replace) the less active one in its compounds.

Chemical activity series:

Descending arrangement of metals according to their chemical activity.

K	Potassium
Na	Sodium
Ba	Barium
Ca	Calcium
Mg	Magnesiur
Al	Aluminiur
Zn	Zinc
Fe	Iron
Sn	Tin
Pb	Lead
H	Hydrogen
Cu	Copper
Hg	Mercury
Ag	Silver
Pt	Platinum
Au	gold

- **Substitution reactions divided into two types:**
  1. Simple substitution reaction.
  2. Double substitution reaction.

*① Simple substitution reaction:

Chemical reaction in which elements substitute another element in a solution of one of its compound.

$$A + BC \longrightarrow AC + B$$

1. *A metal substitutes the hydrogen of water.*	**2-Ametal substitutes the hydrogen of dilute acids.**
EX: reaction of sodium in water	EX: reaction of both zinc and Aluminium with diluted hydrochloric acid
$2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow + heat$	$Zn + HCl \longrightarrow ZnCl_2 + H_2\uparrow$ $2Al + 6HCl \longrightarrow 2AlCl_3 + 3H_2\uparrow$ $Cu + HCl \longrightarrow$ No reaction.
Active metals (that comes before hydrogen in the chemical activity series) substitute hydrogen and produce metal hydroxide and hydrogen evolves.	• Active metals substitute hydrogen in dil. Acids forming metal salts and hydrogen gas evolves. • The more active the metal is, the easier the substitution occur. • Metals that comes after hydrogen in C.A.S. do not substitute hydrogen (Cu).

Give reason

***Although aluminium comes before zinc in C.A.S, aluminum delays after zinc in the reaction with diluted hydrochloric acid.**

Due to the presence of a layer of aluminum oxide (Al_2O_3) on aluminum surface , which takes time to separate from aluminum, that delays the starting of the occurrence of the reaction

3-A metal substitute another one in its salt solution:

- EX: addition of magnesium ribbon to solution of blue copper sulphate. The blue color turns to reddish brown color.

$$Mg + CuSO4 \longrightarrow MgSO4 + Cu\downarrow$$

(blue color) (colorless) (red precipitation)

- Metals can substitute other metals that comes after it in the chemical activity series.

Give reason:-

- ***Magnesium can replace copper in its salt solutions while the opposite doesn't occur.***

Because magnesium precedes copper in C.A.S., so it replaces copper , but copper follows magnesium , so it cannot replace magnesium.

$$Mg + CuSO4 \longrightarrow MgSO4 + Cu\downarrow$$

(blue color) (colorless) (red precipitation)

- ***Don't keep silver nitrates solution in aluminum containers.***

Because aluminum precedes silver in C.A.S., so it replaces silver in silver nitrate solution which leads to eroding of aluminum container

②Double substitution reaction:

- A. Neutralization reaction.
- B. Reaction between acid and salt.
- C. Reaction between two salt solution.

A. *Neutralization reaction*

(reaction between acid and alkali):

- Reaction between acid and alkali to form salt and water.

Acid + Alkali ⟶ Salt + Water

- EX: reaction between sodium hydroxide and hydrochloric acid.

$$HCl + NaOH \longrightarrow NaCl + H2O$$

B. *Reaction between acid and salt: -*

- EX: reaction between sodium carbonate and diluted hydrochloric acid (the evolving gas turbid the limestone).

$$Na_2CO_3 + 2HCl \xrightarrow{dil} 2NaCl + H_2O + CO_2 \uparrow$$

C. *Reaction between two salt solutions:*

- Reaction between sodium chloride solution and silver nitrate solution, forming sodium nitrate and silver chloride (white ppt.)

$$NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$$

(White ppt.)

Give reason:-

A white precipitate is formed on adding silver nitrate solution to sodiumchloride solution.

Due to formation of silver chloride salt which doesn't dissolve in water.

$$NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$$

(White ppt.)

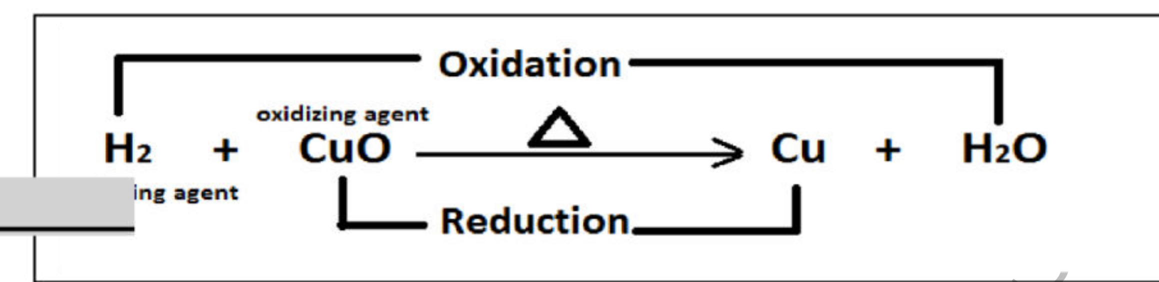
❸ Oxidation and reduction reactions:

A. Losing and gaining oxygen and hydrogen.

B. Losing and gaining electrons.

A. *Oxidation and reduction by losing and gaining oxygen and hydrogen:*

➢ EX: hydrogen gas passes over hot copper oxide.



➢ Hydrogen is oxidized because it combined with oxygen, and it considered as reducing agent as it takes the oxygen from copper oxide.

➢ oxide is reduced as it losses the oxygen, and it considered as an oxidizing agent because it gave oxygen to hydrogen.

B. *Oxidation and reduction by losing and gaining electrons:*

➢ EX: reaction between sodium and chlorine to produce sodium chloride.

$$2\,Na + Cl_2 \longrightarrow 2\,NaCl$$

$$2\,Na \xrightarrow{-2e^-} 2\,Na^+ \text{ (+ ions)}$$

$$Cl_2 \xrightarrow{+2e^-} 2\,Cl^- \text{ (- ve ions)}$$

➢ Sodium is oxidized because it losses electrons, and it reducing agent gives its electrons to chlorine.

➢ Chlorine is reduced because it gained electrons, and it oxidizing agent because it takes electrons from sodium.

Oxidation:

- Chemical processes in which oxygen percentage increases or hydrogen percentage decreases.
- Chemical processes in which the atom losses electron or more.

Reduction:

- Chemical process in which the oxygen percentage decreases or the hydrogen percentage increases.
- Chemical process where the atom gains electron or more.

Oxidizing agent:

- The substance which gives oxygen or takes hydrogen during the chemical reaction.
- Substance which gain electron or more during the chemical reaction.

Reducing agent:

- Substance which takes oxygen or gives hydrogen during the chemical reaction.
- Substance which losses an electron or more during chemical reaction.

Lesson 2: SPEED OF CHEMICAL REACTION

Chemical reactions differ in the time taken to be done, such as:

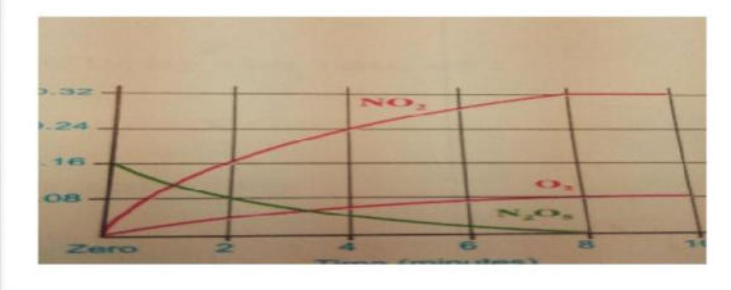
- Some reaction is very fast (fireworks).
- Some reactions relatively slower (the reaction of oil with NaOH to form soap).
- Some reactions need months to occur (rusting of iron).
- Some reactions take million years to occur (formation of petroleum inside the Earth).

***EX①: Decomposition of nitrogen pentoxide N_2O_5:**

$$2\,N_2O_5 \longrightarrow 4\,NO_2 + O_2\uparrow$$

*The opposite figure represent the breaking up of N_2O_5 with time:

- At the beginning of the reaction:
  The concentration of nitrogen pentoxide is 100%, where the concentration of oxygen and nitrogen dioxide is 0%.
- During the reaction (as time passes):
  The concentration of N_2O_5 decreases while the concentration of O_2 and NO_2 increases.
- By the end of the reaction:
  The concentration of N_2O_5 becomes 0% and the concentration of resultants becomes 100%



*Factors affecting the speed of chemical reaction:

1-Nature of reactants

2- The concentration Of reactants

3- The temp. of the reaction

4- Catalysts

1. Nature of reactant

A- kind of bonding. *B- Surface area exposed.*

A-The kind of bonding in reactants:

Covalent compounds	Ionic compounds
They are slow reacting compounds **because** they don't break up into ions as the reaction occurs betweenmolecules. **EX**:- Reaction between organic compound	• They are fast reactants, as they break up into ions and the reaction occurs between ions. • Reaction of sodium chloride silver nitrate: $NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl$ (white ppt.) $Na^+ \; Cl^- + Ag^+ \; NO3^- \longrightarrow Na^+ \; NO3^- + Ag^+ \; Cl^-$

B-Surface area exposed of reactants exposed to reaction:-

- Reaction occurs only in the molecules of the outer layer of the reactants.
- EX: **Steps**:
  - Two flasks with diluted HCl inside.
  - In the first one put a piece of iron, in the second one put iron filings with the same mass.
- **Observation**:

• The reaction in flask 2 occurs faster than flask (1).

➢ **Conclusion**:

The bigger surface area of the reactants is the faster in the reaction.

$$Fe + 2HCl \longrightarrow FeCl_2 + H_2\uparrow$$

Give reason

- ***The speed of chemical reaction increases by increasing the surface area of the reactants exposed to reaction.***
  Due to* increasing the number of molecules of reactants exposed *to reaction.
- **Using nickel filings in hydrating oil instead of piece of nickel.**

Because the speed of chemical reaction increases by increasing the surface area exposed to reaction.

2. Concentration of the reactants:

- As the concentration of the reactants increases, the collision between molecules increases, thus the reaction speed increases.
- **Steps**:
  Two test tube, the first one contains dil. HCl and the second one contains concentrated HCl .
- **Observation:**
  Reaction is faster in tube no. 2.
- **Conclusion:**
  The speed of chemical reactions increases by the increasing in the concentration of the reactants.

$$Mg + 2\,HCl \longrightarrow MgCl_2 + H_2$$

Give reason:-

***The speed of chemical reaction increases by increasing the concentration of reactants .**

Because by increasing the number of reactants molecules, the number of collision between them increases.

***Combustion of the steel scourers used for cleaning aluminium pots in a jarfilled with oxygen is faster than its combustion in atmospheric air.**

Due to increasing the speed of chemical reaction by increasing the concentration of oxygen gas.

3. Temperature of the reaction:

- **By increasing the temperature of the reaction, the movement of the moleculesincreases so the collision increases and the speed of the reaction increases.**
- EX:-
- **Steps**:
  Two effervescent tablets, put the first one in hot water beaker and the second one in cold water beaker.
- **Observation:**
  Faster effervescent occur in the first beaker.
- **Conclusion:**
  The speed of the reaction increases by increasing the temperature of the reaction.

Life application

- **To cook food faster:** increase the temperature of the flame.
- T**o stop reactions in food** (to preserve food for longer time), keep it in refrigerators (low temperature).
- **Give reason:-**

The fridge is used to preserve food.

Because the low temperature in the fridge slows down the speed of the chemical reactions done by bacteria which causes rot of food.

4-Catalysts:

Chemical substances increase the speed of the reaction without changing or being used.

Types of catalysts:

Positive Catalysts	Negative Catalysts
Catalyst which speed up thechemical reaction.	Catalyst which slow down the chemicalreaction.

Activity:

Steps:

- **Put equal amounts of hydrogen peroxide in two test tubes.**
  Put a small amount of magnesium dioxide in tube no. (2).

Observation:

Reaction in tube 2 is faster than tube (1).

Conclusion:

MnO_2 (Manganese dioxide) is a positive catalyst which increases the breakingup of hydrogen peroxide (H_2O_2) into water and oxygen.

$$2H_2O_2 \longrightarrow 2H_2O + O_2$$

Properties of catalysts:

1) **They change only the speed of the reaction but it doesn't affect its beginning or ending.**
2) **No chemical reaction or decrease in mass occur to catalyst before or after thereaction.**
3) **They are bonded to the reactant to increase the speed of the reaction and thenseparated to form the reactants.**
4) **They decrease the energy needed for the reaction.**
5) **They are used in small amounts only, which is enough to complete thereaction.**

Enzymes

They are chemical substances produced by the bodies of living organisms and act as a catalyst to increase the speed of the biological reaction.

Enzymes in human body have very important functions in breathing,moving, and food digestion.

- **The biological reactions occur in the presence of enzymes rapid morethan thousands time than without enzymes.**
- **Activity: put a piece of sweet potato (contains oxidase enzyme)**
- **into beaker with hydrogen peroxide (H_2O_2).**
- **Oxidase enzyme acts as a catalyst and help in decomposition of H_2O_2.**

Science technology:

Catalytic converter:

A metallic can exists in cars to treat the harmful gases emitted from the engine.

***Structure:**

Ceramic cells covered with a thin layer of catalyst metal as platinum orpalladium

***Importance:**

Treatment and purification of harmful gases emitted from the car engine

- Ceramic cells (which are similar to bee cells) increase the surface areaexposed to the reaction to economize the use of expensive metals.
- The catalysts increase the speed of reactions with harmful gases emittedfrom the engine.

Exercises

Q.(1): Complete:

1. **The change in the concentration of reactant and resultant in a unit time is.......................**
2. **Oxidization is the chemical process in which the atom.........................an electron or more.**
3. **The …………………..is the reaction between acid and alkali to form salt andwater.**
4. **During ……………………reaction, the compound decomposes by heat intoits simple components.**
5. **In the beginning of the reaction the concentration of reactants is ………………………..%.**
6. **Covalent compounds are …………………………….in their compounds.**
7. **Substances that give oxygen or remove hydrogen is called ……………………………… .**
8. **A substance which increase the chemical reaction without sharing in the reaction is………………………….. .**
9. **The increasing in the concentration of the reactants makes the speed of thereaction……………………………**

Q.(2): Give reasons:

1. **The fridge is used in food preservation.**
2. **Sodium can replace hydrogen of the acids.**
3. **Rate of chemical reaction increases by the increasing of the reactantconcentration.**
4. **Reaction of iron fillings with diluted hydrochloric acid is faster than itsreaction with a piece of iron.**
5. **Reaction between ionic compounds is fast while reaction between covalentcompounds is slow.**
6.

Q.(3): write the balanced equations the following reactions:

1. Effect of heat on:
   a) Red mercuric oxide.
   b) Copper hydroxide.
   c) Sodium nitrate.

   Addition of water to:
   d) Sodium metal.
   e) Ammonia gas.
2. Effect of adding hydrochloric acid to:
   a) Zinc metal.
   b) Sodium hydroxide.

Q.(4): Mention one function of:

1. Enzymes 2. Catalyst.

Q.(5): Identify the processes of oxidization, reduction, oxidizing agent, and reducing agent in the reaction of sodium and chlorine to form sodium chloride:

Na_{11} Cl_{17}

Q.(6): Choose:

1. Heating of metal hydroxide produces ………………………… .
   a. Metal oxide only.
   b. Metal oxide and CO_2.
   c. CO_2 gas only.
   d. No correct answer.

2. **Blue copper hydroxide is decomposed by heat into …………………………….**
   a. **Copper oxide and oxygen.**
   b. **Copper oxide and water vapor.**
   c. **Copper and water vapor.**
   d. **A and c are correct.**

3. **Potassium reacts with diluted hydrochloric acid forming…………….salt.**
   a. **Potassium nitrate.**
   b. **Potassium sulphate.**
   c. **Potassium chloride.**
   d. **No correct answer.**

4. **When sodium atom losses an electron from its outer most energy level, it becomes ……………………….**
   a. **Oxidized.**
   b. **Reduced.**
   c. **Reducing agent.**
   d. **d. a and c are correct.**

Unit 2 : Electric activity and radioactivity.

Lesson 1: Physical properties of the electric current.

***Electric current**:- is the flow of electric negative charges (electrons) through a conducting material

HOW IS ELECTRIC CURRENT GENERATED?

- The nucleus of the atom contains positively charged protons which attract the negatively charged electrons rotating around the nucleus.
- In the absence of this force electrons become free and with the connection of the wire to electricity, electromotive force is generated and electrons move in the wires creating electric current.

*PHYSICAL CONCEPTS OF THE ELECTRIC CURRENT:

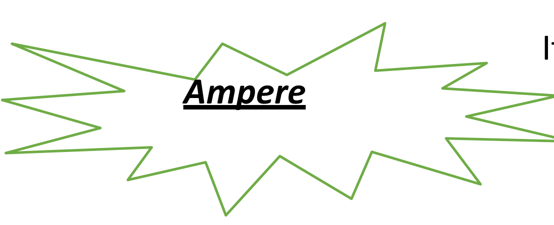
1. Current intensity.
2. Electric potential difference.
3. The electric resistance.

① Current intensity:

- The quantity of electricity in coulomb.
- The electric charges flowing through a cross section of the conductor in one second.

- It is measured by an instrument called Ammeter (A) and themeasuring unit called Ampere.

$$\text{Current Intensity (I)} = \frac{\text{quantity of charge (Coulomb)}}{\text{Time (second)}}$$

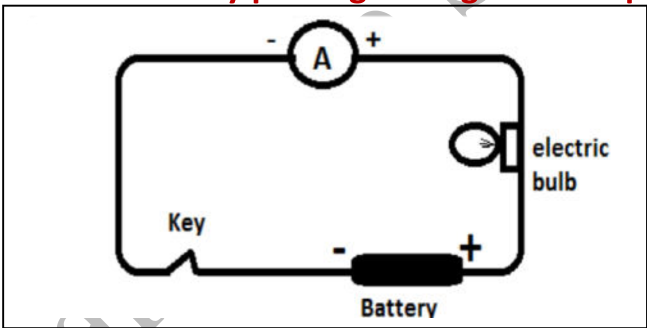


It is electric current passing through a circuit when a charge of one coulomb passes through a given cross section in one second.

coulomb

It is the quantity of charges transferred by a constant current of intensity one Ampere in one second.

- **Connect an electric circuit , the lamp turns on and the pointer of the Ammeter point to certain reading which is the current intensity passing through the lamp.**



- EX: Calculate the current intensity due to the flow of 5400 coulombs through a cross section of a conductor for 5 minutes.

Time in seconds = 5X60 = 300 sec.

Current intensity $= \frac{quantity\ of\ charge}{Time} = \frac{5400}{300}$ **= 18 Amperes.**

Technological application

Uncut electric charger device:- it is used to store the electric current for long orshort period of time then it provides the current devices with electric current

② *The electric potential difference:*

- **Potential difference of a conductor is the state of an electric conductor that shows thetransfer of the electricity to and from it when it is connected to another conductor.**

$$\text{Potential difference (v)} = \frac{\text{Work}}{\text{Quantity of electricity}}$$

- ***Joule:*** **the amount of work done by a force of one Newton moving an object through a distance of one meter in one second.**

- **Potential difference is measured by Voltmeter (V) and the measuring unit is Volt.**

- ***Volt:*** **the potential difference between the two poles of a conductor on doing awork of 1 joule to transfer a quantity of electricity 1 coulomb.**

- ***Voltameter:*** **is connected to the electric circuit in parallel.**

- ***ELECTROMOTIVE FORCE (e.m.f.):***

The potential difference between the two poles of a battery when the electric circuit is opened, **(It is measured by volt) .**

What is meant by

1-The electromotive force of an electric cell is 1.5 volt.

This means the potential difference between the two poles of the battery when the electric circuit is open = 1.5 volt.

2- A work of 30 joule is done to transfer charge of 10 coloumb between two points.

This means that the potential difference between 2 points equals 3 volt.

What happens when and why?

***Two conductor that have the same electric potential are connected by wire.**

No electric current will pass through them, because there is no potential difference between them (potential difference =0)

Potential difference across two terminals of a conductor.

It is the value of the work done to transfer a quantity of charge (one coulomb)between the two poles of this conductor.

Key

Battery

Measuring the potential difference between the 2 ends of an electric lamp.

Measuring the potential difference of a battery or (e.m.f) (Circuit is opened)

③ *The electric resistance:*

- The opposition that the electric current faces during its passing through a conductor.
- Ohmmeter is used to measure the electric resistance.
- Its unit is Ohm.

Types of electric resistance:

1. Constant.
2. Variable.

- **Variable resistance:(Rheostat)**
  - Which is the resistance that you can change its value in order to adjust the value of the current and potential difference in different part of the circuit.
  - **Consists of:**
    1. Metal wire of high resistance, coiled around a cylinder of insulated substance like porcelain.
    2. Thin copper sheet is touching the wire and can slide over it for the whole length of the cylinder and known as slider.

***How to work the variable resistance:**

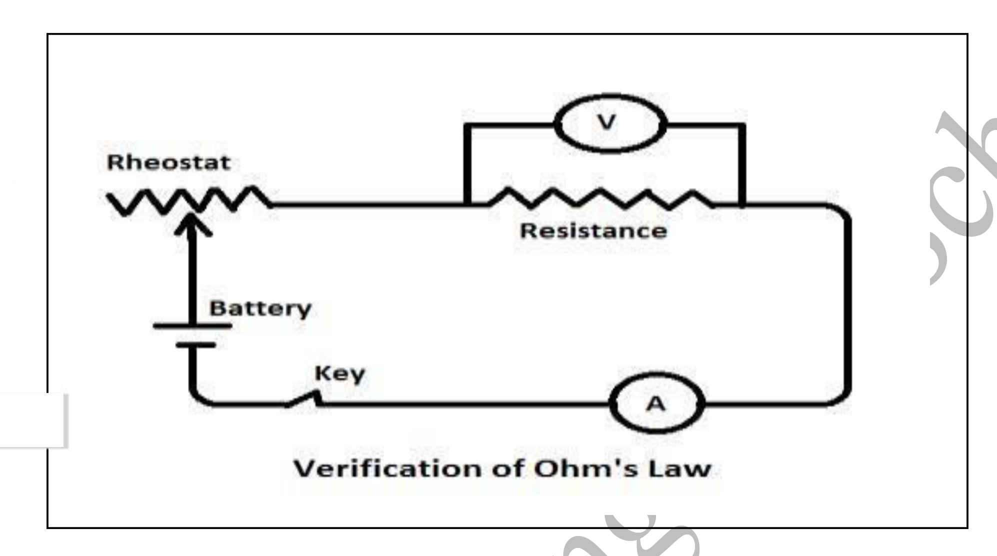
- Through the slider you can control the resistance that the current face while passing in the wire, that's by controlling the length of the wire that enters the circuit.
- If the length of the wire increase, the resistance will increase and the current intensity will decrease.

Ohm:- ***It is the resistance of conductor in which a current of one ampere passes when it is subjected to a potential difference of one volt.***

Ohm's Law:

To determine the relation between the current intensity and potential difference.

1. Connect an electric circuit as shown in figure:



Verification of Ohm's Law

2. Switch on the current by the key, record the reading of Ammeter (I) and voltmeter(V).
3. Change the resistance by using the rheostat's slider, and record the readings again.
4. Repeat step no. 3 several times.

$$\textbf{Electric resistance (R)} = \frac{\textbf{Potential difference (v)}}{\textbf{Current intensity (I)}}$$

1. The potential difference between the two ends of a conductor is directly proportional to the intensity of the current passing through this conductor when the resistance is constant.

Ohm's Law:

The electric current intensity passing through a conductor is directly proportional with the potential difference between its ends when the temperature is constant.

V = Constant X I

V = R X I

What happens in the following cases:-

- ***Increasing the value of the electric resistance to double its value,at constant temperature(concerning the current intensity).***
  The electric current intensity will decrease to half its value.

- ***Increasing the potential difference between the two terminal of a conductor to double its value , at constant temperature(concerning the electric current intensity.***
  The electric current intensity will increase to double its value.

- **Burning the fixed resistance in an electric circuit (concerning the reading of an ammeter connected to the circuit in series and that of a voltmeter connected to the battery in parallel).**
  The reading of the ammeter = zero , but the reading of the voltmeter still as it

Resistance:

The ratio between the potential difference of the two ends of a conductor and the current intensity.

Ohm:

The resistance of a conductor which allows the passing of an electric current its intensity is one ampere and the potential difference between its end is one volt.

Ampere:

The current intensity passing through a conductor whose resistance is one Ohm and the potential difference between its two ends is one volt.

Volt:

The potential difference between two poles of a conductor whose resistance is one ohm and the intensity of the electric current passing through it is one ampere.

Lesson 2: Electric current and cells

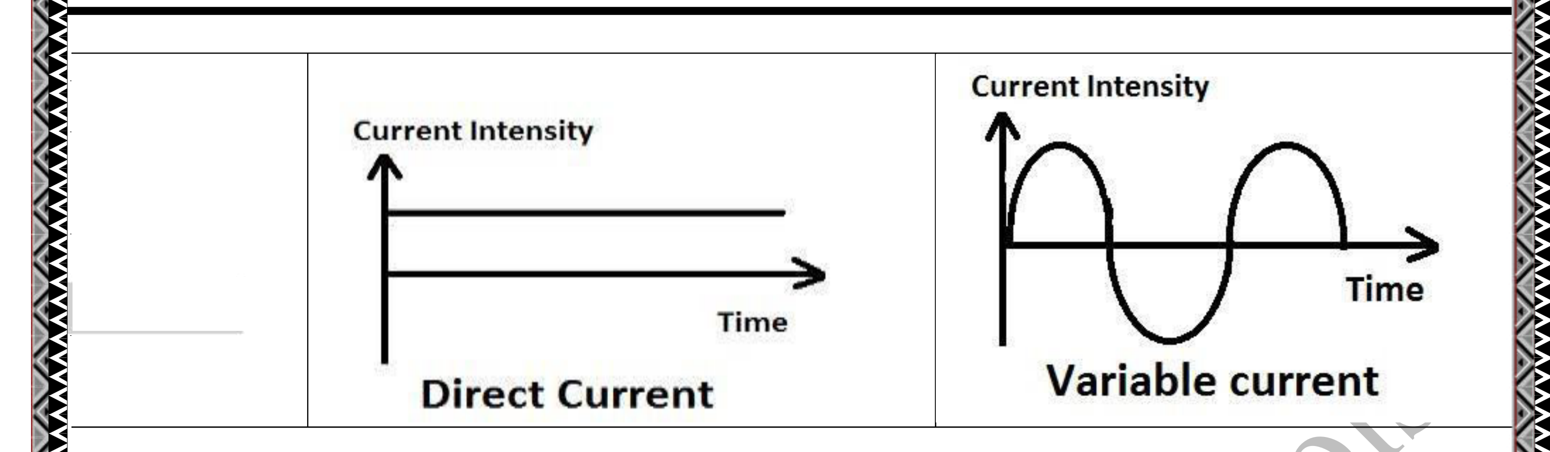
*Sources of electric current:

Two ways to generate electric current:

Converting the chemical energy to electric energy in electrochemical cells (batteries or dry cells)	Converting the mechanical energy to electric power by using electric generator or dynamo
The electric current produced is called " Direct current"	The electric current produced is called "alternating current"

*Types of electric current:

	Direct current (D.C.)	*Alternating current (A.C.)*
Definition	Electric current with constant intensity, which flows in one direction as electrons flow from one pole of the electrochemical cell to all the component of the circuit, then to the other pole.	Electric current with variable intensity, which flows in two directions, as electrons flow in one direction at the beginning then starts to flow in the opposite direction. This cycle is repeated many times with high speed.
Intensity	Constant intensity	Variable intensity
Source	Electrochemical cells or dry cells	Electric generators as dynamo
Transport	Only transported to short distances.	Can be transported to short or long distances.
Uses	Electroplating and operating some electric appliances.	Lighting houses, streets or operating electric appliances.
Conversion to another	Cannot be converted into an alternating current.	Can be converted into direct current.

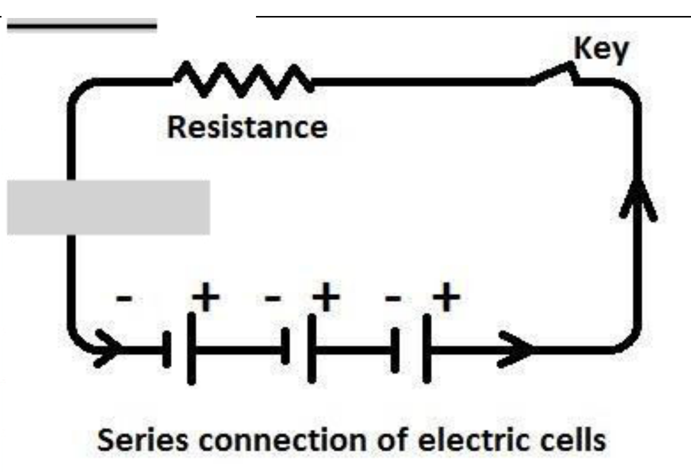


Give reason

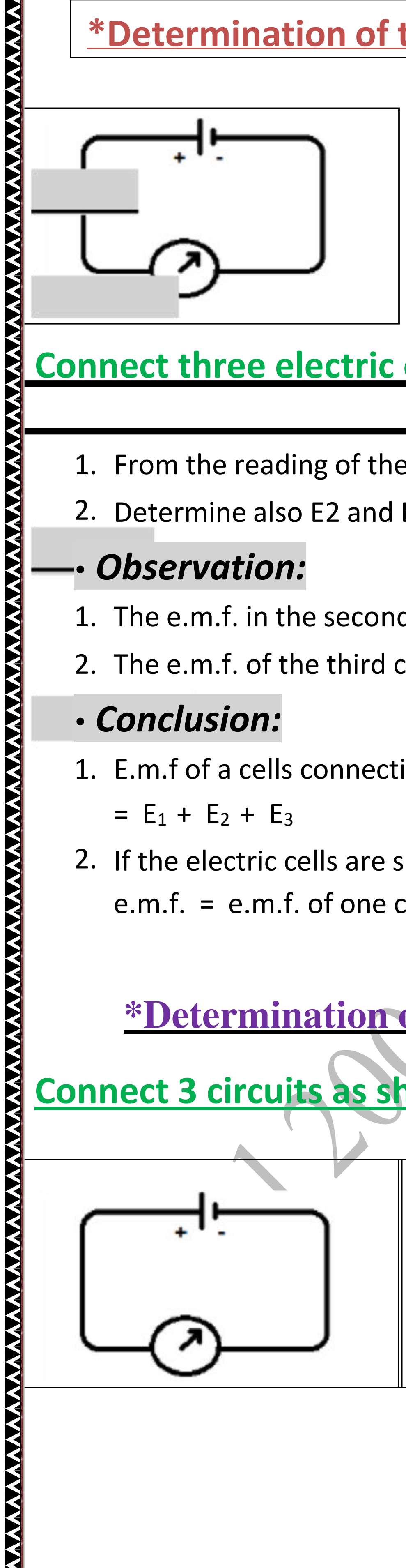
-**The alternating current is preferred than the direct current.**

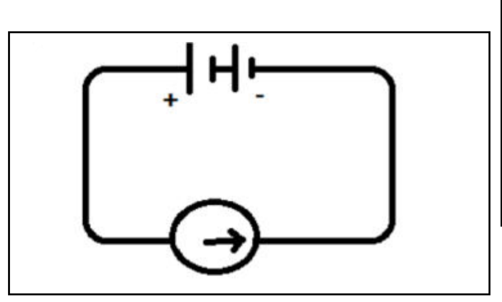
Because it can be transported for long distances, it can be changed into direct current and it is used in operating many electric appliances.

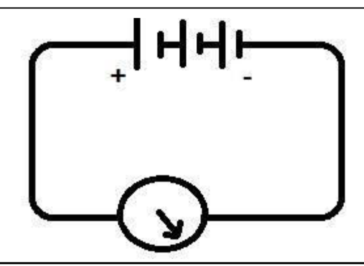
*Methods of connecting the electric cells in a circuits:

Connection in series	Connection in parallel
By connecting the negative pole of the first cell to the positive pole of the second with copper wire, then connecting the –ve pole of the second to the +ve pole of the third and so on. The +ve pole of the first cell and the negative pole of the last cell are considered the two poles of the electric	By connecting the positive poles of all electric cells together, and connecting the negative pole of all cells together with copper wires. There will be one positive pole and one negative pole.
 Series connection of electric cells	Resistance Key Parallel connection of electric cells
e.m.f = the sum of e.m.f.s of these cells $E = E_1 + E_2 + E_3$ Or e.m.f. = e.m.f. of one cell X n Where n = number of similar cells	e.m.f. = e.m.f. of one cell - it is used to obtain low (e.m.f)

*Determination of the electromotive force of cells connecting in







Connect three electric circuits as shown:

1. From the reading of the voltmeter in circuit 1 you can determine the E_1.
2. Determine also E2 and E3 from the second and third voltmeter.

- ***Observation:***

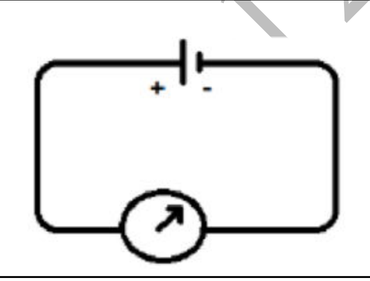
1. The e.m.f. in the second case is twice the first case.
2. The e.m.f. of the third case is three times the first case.

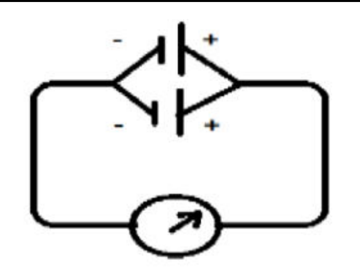
- ***Conclusion:***

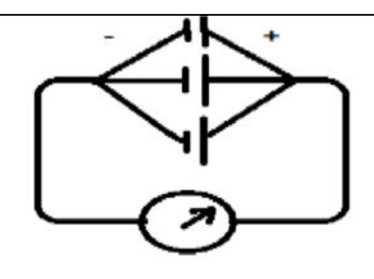
1. E.m.f of a cells connecting in series = the sum of e.m.f.s of these cells. e.m.f = $E_1 + E_2 + E_3$
2. If the electric cells are similar :
   e.m.f. = e.m.f. of one cell X n (which is the no. of cells)

*Determination of e.m.f. of cells connecting parallel:

Connect 3 circuits as shown:







- **Observation:**

The reading of voltmeter in the three cases are the same

- **Conclusion:**
  e.m.f. = e.m.f. of one cell.

***Ex:** A battery consists of three electric cells, the e.m.f calculate the electromotive force when the cells

1. **In series:**
   e.m.f. = e.m.f. X n = 3 X 3 = 9 volts.
2. **In parallel:**
   e.m.f. = e.m.f. of one cell = 3 volts.

Give reason

***Some electric cells are connected in parallel in the electric circuit.**

To obtain a battery , the e.m.f of it is low.

***Some electric cells are connected in series in the electric circuit.**

To obtain a battery , the e.m.f of it is high.

Lesson 3: Radioactivity and Nuclear Energy

- The nucleus of the atom is an energy store.
- ***Give reason*:-the nuclei of the atoms of the stable elements are coherent although the presence of repulsion force inside them.**
- Due to a force that binding the nucleus components and the repulsion force between the positively charged protons inside the nucleus, alsothe attraction force between the protons and neutrons.
- These forces give the nucleus tremendous force called ***Nuclear Energy.***

*Discovering the radioactivity phenomenon:

Henry Becquerel (French) who discovered for the first time the emission of unseenrays from uranium element which has the ability to penetrate solid things.

*What's meant by the radioactivity phenomenon (natural radioactivity):-

The spontaneous decaying of the atom's nuclei of some elements that are present innature in an attempt to achieve a more stable composition (the nucleus contain a number of neutrons more than required for its stability).

Radioactive elements

They are elements whose atom's nuclei contain a number of neutronmore than the number required for its stability.

Ex. Radium – Uranium – cesium – Polonium – Rubidium – Selenium- Zirconium

Heavy unstable elements (uranium) —— Lose part of their energy as alpha ,beta , gamma particles ——→ ***stable elements***

Give reason:- ***Nuclei of radioactive elements are unstable.***

Due to their excess energy because of neutrons is more than the number required for its stability.

Types of Radioactivity:

Natural Radioactivity

Artificial Radioactivity

Released during nuclear reaction or nuclear bomb

Peaceful uses

Nuclear reaction can be controlled

Military uses

Cannot be controlled

(Nuclear bombs)

*Peaceful uses of nuclear energy:

1. ***Medical field:*** treat and diagnose diseases like cancer.
2. ***Agricultural field:*** eliminate pests and improving some plant races.
3. ***Industrial field:***

- Converts sand to silicon sheets which is used in manufacturing computer processors and programmed electric circuits that are used in electric appliances.
- Discover the defects in manufactured products.

4. ***Electricity generating field:*** the temperature produced from the nuclear energy is used to heat water till boiling. The water steam produced is used to operate the turbines to generate electricity.
5. ***Space exploration field***: nuclear fuel used in rockets that fly to space.
6. **Drilling field:** drilling for petroleum and underground water

- ***Risks and Harmful effects of radioactivity pollution:-***

Radioactive pollution *:-it is the increase of the amount radiation in the environment.*

There are 2 sources of radioactive pollution:

1. ***Natural source:***
   The natural radiation found on the earth and cosmic radiation that comes from the outer space.
2. ***Artificial source:***
   - As a result of explosion of nuclear bomb that some countries experiment.
   - Due to the nuclear reactors, these lead to increase the amount of radiation in the environment which leads to radioactive pollution.

- **Chernobyl accident:**

- On 26 April 1986, explosion occur in Russian reactor as a result of an error in operation.
- This result in the melting of its core which leads to a nuclear explosion and the release of many radioactive elements and their atoms are carried by wind to most of the countries of Europe.
- The accident cause pollution of food crops by radioactive elements.
- The peak of pollution was when rains fell in May of the same year which makes the atomic dust reaches the earth either with dry falling or with polluted rains.
- Therefore plants and soil are polluted by the fallen radioactive isotopes and thus cows and sheep also so there milk products and meat are also polluted.

***Isotopes :-** are atoms that contain the same number of protons and different in number of neutrons.

Note

* The elements which are found in the polluted food after the accident were **iodine** and **cesium** isotopes. They are elements produced from the decay of nuclear fuel (Uranium – 235) when absorbing the neutrons and carried by the clouds and wind as radioactive dust.

*** The radiation effect on human body:**

Effects of exposure to a large doses of radiation for short time.	**Effects of exposure to small doses for long period of time (months or years)**
Damage of the bone marrow, spleen, the digestive system and the central nervous system. The bone marrow cause the reduction of red blood cells which cause the feeling of being sick, having a sore throat, nausea, vertigo and diarrhea.	**A. Physical effect: -** Change that appear on the living organism like skin cancer . **B. Geneic effect:-** The change in sex chromosomes.which results in abnormal births **c. Cellular effect:** change in cell composition, which lead to destroy the cells. the chemical composition of hemoglobin changes and it becomes incapable to carry oxygen.

Give reason:- ***the radiation pollution may be occurred in areas at which a nuclear explosions is not occurred.***

Because the radiation pollution may be transferred by the dry fallen by the wind or by falling of rains to the earth's surface.

The measuring unit of radiation is Sievert (SV).
1 milli Sievert = 10^{-3} Sievert.

*Means of protection from nuclear radiation:

1. **The safe dose of nuclear radiation is 20 milli Sievert per year for radiologists**

   And 1 milli Sievert per year for puplic.
2. **The workers with radioactive elements should wear the radiation protective gloves, cloths and masks.**

3. **Follow these precautions with the radioactive wastes:**
   - **These wastes should be away from underground water streams.**
   - **The area chosen to store the radioactive wastes in should be stable andnot exposed to earthquakes or volcanoes.**
   - **The area chosen to store the wastes should be away from animals thatlive in caves so it couldn't turn the dangerous to other animals.**

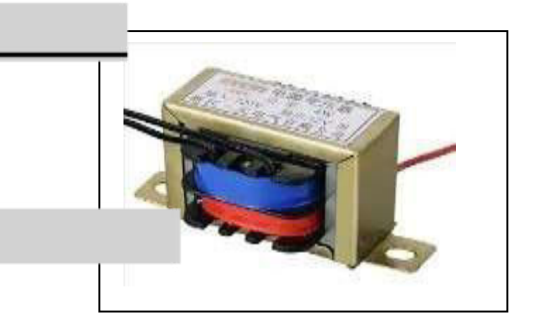
4. **The nuclear wastes are disposed according to their intensity of radiation:**
   - **Wastes with weak and medium radiation covered with cement layer andburied deep inside the ground.**
   - **Wastes with strong radiation are placed in water first to cool down andthen deeply buried in the ground away from inhibited areas.**

5. **Place laws for nuclear plants to cool the hot water before throwing it in the seas and lakes. Some plants make artificial lakes for themselves for coolingpurposes.**

***Science technology:**

1. **Electric transformer:**
   The electric voltage at home is 220 voltage, but when you get a device which operated by voltage 110 volt you must have the electric transformer by which you can get the required voltage.

2. **Uncut electric changer device:**
   By which you can store electricity for long or short periods. It can provide all the home devices with electricity when the current in home is not found.



Electric transformer



Uncut electric charger

Unit 2 Revision

Q.(1):choose:

1. The …………………………. effects of radiation is a result of changing the sex chromosomes of the cell.
   (physical - genetic - cellular)
2. ………………………. Is a non- radioactive element.
   (radium - uranium - iron)
3. The apparatus which is used in measuring potential difference is ………………………….. .

(voltmeter - Ammeter - ohmmeter - rheostat)

4. To generate an alternating electric current, we use the …………………………….. .

   (rheostat - dynamo - ammeter - ohmmeter)

5. In dry cell, ……………….. energy is converted to electrical energy.

   (magnetic - kinetic - chemical - light)

6. Four similar electric cells, each has e.m.f 1.5 volt are connecting in series, the total e.m.f.
   equals .... volt.

   (3 - 6 - 1.5 - 12)

7. The scientist who discovered the radioactivity phenomenon was ……………………..

   (Ohm - Becquerel - Ampere - Mendel)

Q.(2): Give reasons:

1. Some elements are called radioactive elements.
2. Radiation has genetic effects.
3. The region selected to save radioactive wastes must be stable.
4. Alternating current is preferred than the direct current.
5. Rheostat is used in some electric circuits.
6. After the Chernobyl accident, radioactive isotopes were found in the food products.

Q.(3): what's meant by:

1. Ohm's Law
2. Voltmeter
3. Electric potential

4. Radioactivity
5. Sievert
6. Electric current

Q.(4): write the scientific terms:

1. Flow the electric charges through a conductor. (................................)

2. The resistance that faces the electric current during its passing through a conductor. (…........................)

3-An apparatus used in measuring the electromotive force.(…..........................)

3. The process of spontaneous decaying of atoms of some elements present in nature. (… ....)
4. The changes that takes place to the living organisms due to its exposure to radiation. (............................)

5. The radiation and nuclear energy emitted during nuclear reactions that can be controlled and carried out at nuclear reactors. (…………………….)

Q.(5): Answer the following question:

1. Calculate quantity of electricity when an electric current of intensity 18 ampere passes for 7 minutes through a conductor.
2. Calculate the electric current intensity when a quantity of electricity of 600 coulomb passes for 3 minutes in a conductor.
3. Calculate the e.m.f. for a battery consists of 3 cells, the e.m.f. for each 1.5 volt when they are connected in series and in parallel.

4. Calculate the potential difference between the terminals of an electric set its resistance is 30 ohm and the intensity of the passing electric current is 10 ampere.

Q.(6): Mention the most important uses of:

1. Alternating current.
2. Dry cell.
3. Nuclear energy in exploring spaces.
4. Nuclear energy in drilling.

Unit 3: Genetics

Lesson 1: Main Principles of Heredity

Heredity traits	Acquired traits
They are traits that transmitted from one generation to another. EX: color of eye, color of hair blood groups.	They are traits that can't be transmitted from one generation to another.

Genetics

It is the science that searches the transmission of the hereditary traits from one generation to another by studying the similarities and differences between the parents and the offspring.

***Mendel experiment:**

- He is the scientist who placed the basics of heredity.
- Mendel choose the garden pea plant for his experiment because:

1. Easy to be planted and fast grow.
2. The life cycle is short.
3. Its flowers are hermaphrodite so it can be self - pollinated.
4. It can be easily artificially pollinated (human intervention).
5. It produces a large number of offspring in one generation.
6. It has several contrasting traits.

   Ex.: Some have white flowers and some have red flowers.

   - Some have green pods others have yellow pods.
   - Some have long stems and others have short stems.

Mendel choose 7 traits to do his experiment:

Seed shape	Seed color	Pod shape	Pod color	Flower color	Flower position	Stem height
smooth	Yellow	Swollen	green	red	side	Tall
wrinkled	Green	Sinuous	yellow	white	end	Short

Note:

- ***Hermaphrodite flower:-***

  It is flower that carries the male and female organs together.

- ***Self –pollination:-***

It is transfer of pollen grains from the anthers of a flower to the stigma of the same flower.

Mixed pollination:- *It is transfer of pollen grains from the anthers of a flower to the stigma of another flower in another plant.*

*Mendel's experiment to study the seed color of the pea plant:

1. Mendel planted pea plant that produces yellow seeds and another one that produces green seeds for many generations **to make sure of the purity of these traits**. He made that by ***self- pollination.***

2. He planted the seeds of both plants and after growing he removed the stamen of these plants before they become mature, to control the pollination.
3. By means of cross pollination, he pollinated flowers of the plant which produce yellow flowers with pollens from the plant which produce green flowers and vice versa, then he covered the stigmas of pistils in order to prevent the pollination from the other flowers.

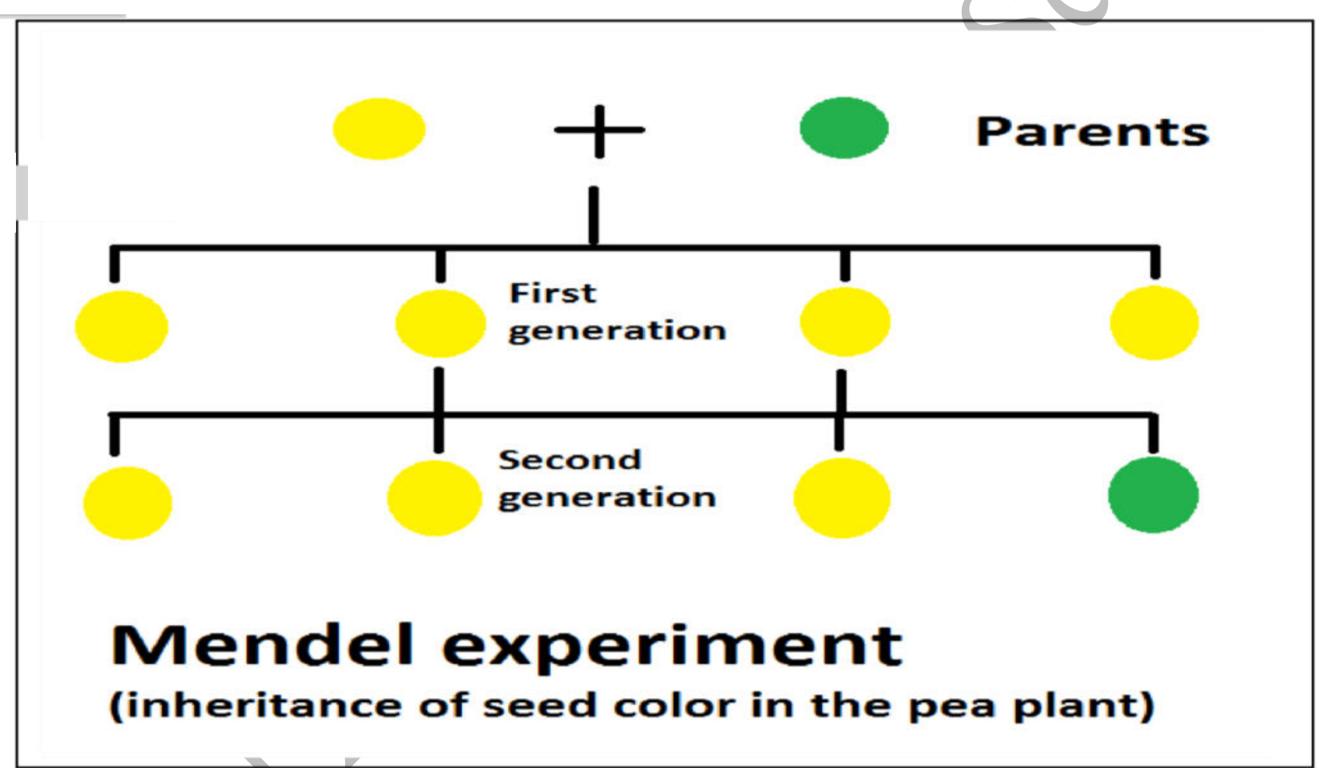
- ***Observation:***

He observed that all plants produced (first generation) are yellow seeds plant and the green seeds are disappeared completely. So he called:

Yellow seeds — Dominant trait

Green seeds — Recessive trait

4. He left the first generation self-pollinated and he planted the resulting seeds to get the Second generation, in which quarter is green seeds and three quarters are yellow seeds.



*The principle of complete dominance:

- **He repeated the same experiment for the rest traits and he found:**
  - **The long stem dominates over the short stem.**
  - **The red color of flowers dominates over the white color.**
  - **The side position of the flower trait dominates over the end position.**
  - **The smooth seeds trait dominates over the wrinkled seeds.**
  - **The swollen pod trait dominates over the sinuous.**
  - **The green pod color dominates over the yellow pod.**
- He observed that one of each pair of trait disappear completely in the first generation then the two contrasting traits appear in the second generation in a ratio (3 : 1).
- Mendel named the traits that appear in the first generation as the **Dominant trait** and
- The traits which disappeared in the first generation as the **Recessive traits**.

Give reason:-On mating a pea plant of yellow seeds with a pea plant green seed, all the produced plants are of yellow seeds.

Because the yellow colour trait of seed dominates over the green colour trait of seeds accordingto the principle of complete dominance.

The principle of complete dominance:

The appearance of a dominant hereditary trait in the individuals of the first generation when two individuals are crossed over, one of them carries a pure trait contrasting thetrait carried by the other individual.

P.O.C	Hybrid (impure) individual	Pure individual
Definition	The individual who carries a different (contrasting) pair of genes one is dominant and the other is recessive.	The individual who cartries asimilar pair of gene either dominant or recessive
Trait appears	Dominant over recessive	The pure trait appears.

Gametes:-

The cells by which the hereditary traits are transmitted from parents to offspring.

***Mendel's Assumptions of the Mendel's first law:**

1- The hereditary traits are transmitted from the parents to offspring by means of hereditary factors which are known as the gene.
2- In a living organism, every hereditary trait is controlled by two factors (one from each parent) they are:
   - Similar or Homozygous if the trait is pure (Ex: YY)
   - And not similar or Heterozygous if the trait is impure or (Hybrid) Ex: Yy
   - The two hereditary factors are separated when the gametes are formed, where each gamete carries one factor for each hereditary trait.

Mendel's First Law: The Law of Segregation of factors:

When two individuals of any pair of hereditary traits are different from each other, only the dominant trait appears in the first generation, while the two traits appear in the second generation in ratio of **3 dominant : 1 recessive.**

***Using symbols to represent the results of the experiment:**

- Y ______________ represents the yellow dominant trait.
- y ______________ represents the green recessive trait.

So:

- YY_____________ pure yellow seeds plant.
- yy______________pure green seeds plant.

Pure yellow seed   Pure green seeds

P   YY   yy

G   Y   y

$\mathbf{F_1}$ Yy

Yellow hybrid seeds

Yellow hybrid seeds   Yellow hybrid seeds

P   Yy   Yy

G   Y   y   Y   y

F2   YY   Yy   Yy   yy

Yellow seeds   green seeds

*Mendel's Second Law: the Law of Independent assortment of hereditary factors:

- **Mendel conducted a mixed pollination between two pure pea plants:**
  - Plant with tall stem and red flower.
  - Plant with short stem and white flower.
- **He observed that all the first generation plants had tall stem and red flowers and when he left the first generation to self pollinated, the second generationwas as following:**

9	3	3	1
Tall stem, red flowers.	Tall stem, white flowers.	Short stem, red flowers.	Short stem, white flowers.

- In the first generation the dominant traits appeared (tall stem and red flowers)

➢ In second generation:
  - The ratio between the number of red flowers (dominant) to white flowers (recessive) was 12:4 thus 3:1.
  - The ratio between the number of tall stem (dominant) to the short stem (recessive) was 12:4 thus 3:1.

Mendel's Second Law: The Law of Independent Assortment of hereditary Factors:

When two individuals bearing a pair or more of alternative (Contrasting) traits are crossed, the trait of each pair is inherited independently of the others and appearsin the second generation at a ratio of 3: 1.

***Ex: smooth shaped seeds and yellow in color (dominant) with wrinkledshaped seeds and green in color(recessive):**

P : YYRR (dominant) X yyrr (recessive)

G : YR yr

F1 : YyRr (wrinkled and green color)

P : YyRr X YyRr

G :

	YR	**Yr**	**yR**	**yr**
YR	YYRR	YYRr	YyRR	YyRr
Yr	YYRr	YYrr	YyRr	Yyrr
yR	YyRR	YyRr	yyRR	yyRr
yr	YyRr	Yyrr	yyRr	yyrr

- In the first generation the dominant trait appeared which is smooth and yellow colored seed.
- The first generation produce four types of gamete for each individual.
- The ratio between the yellow seeds to the green seeds in the second generation is 12:4 thus 3:1.

- The ratio between the smooth seeds and the wrinkled seeds is 12:4 thus 3:1.

*The dominant and recessive traits in human being:

- Many humane hereditary traits follow the Mendelian hereditary where the traits are controlled by one pair of genes.
- The individual who receives at least one dominant trait from one parent, will have the dominant trait.
- Only who recessive genes from both parent, will have the recessive traits.
- EX: dominant and recessive traits in human being:
    - The ability to roll the tongue is dominant trait.
    - The free ear lobe is dominates the attached lobe.
    - The curly hair trait dominates the straight hair.
    - The wide eyes trait dominates the narrow eyes trait.
    - The presence of check dimples trait dominates the absence of dimples trait.
    - The absence of freckles in the face dominates the presence of freckles trait.



Wide eyes



narrow eys



Curly hair



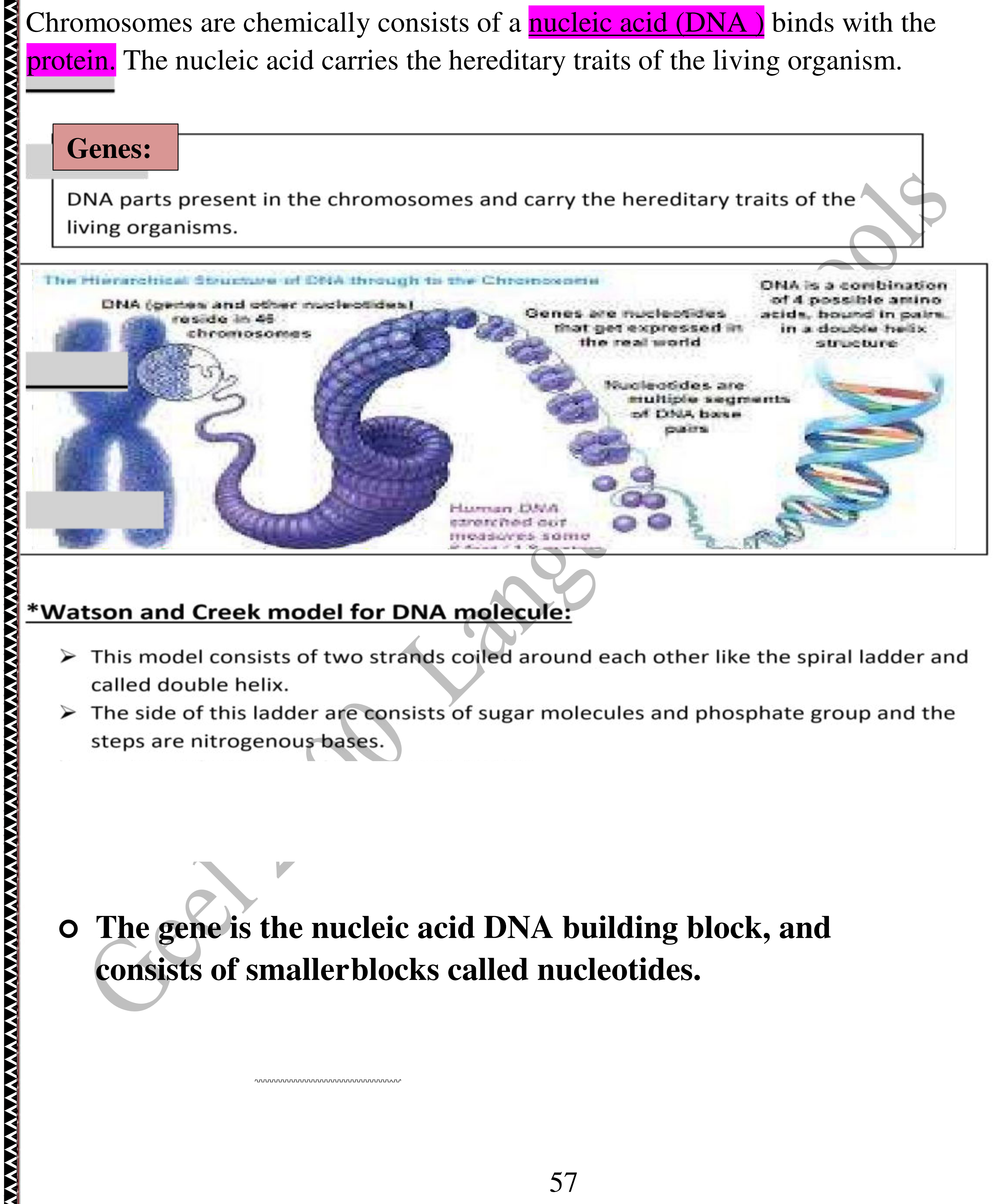
straight hair

-The chemical structure of nucleic acid (DNA)

Chromosomes are chemically consists of a nucleic acid (DNA) binds with the protein. The nucleic acid carries the hereditary traits of the living organism.

Genes:

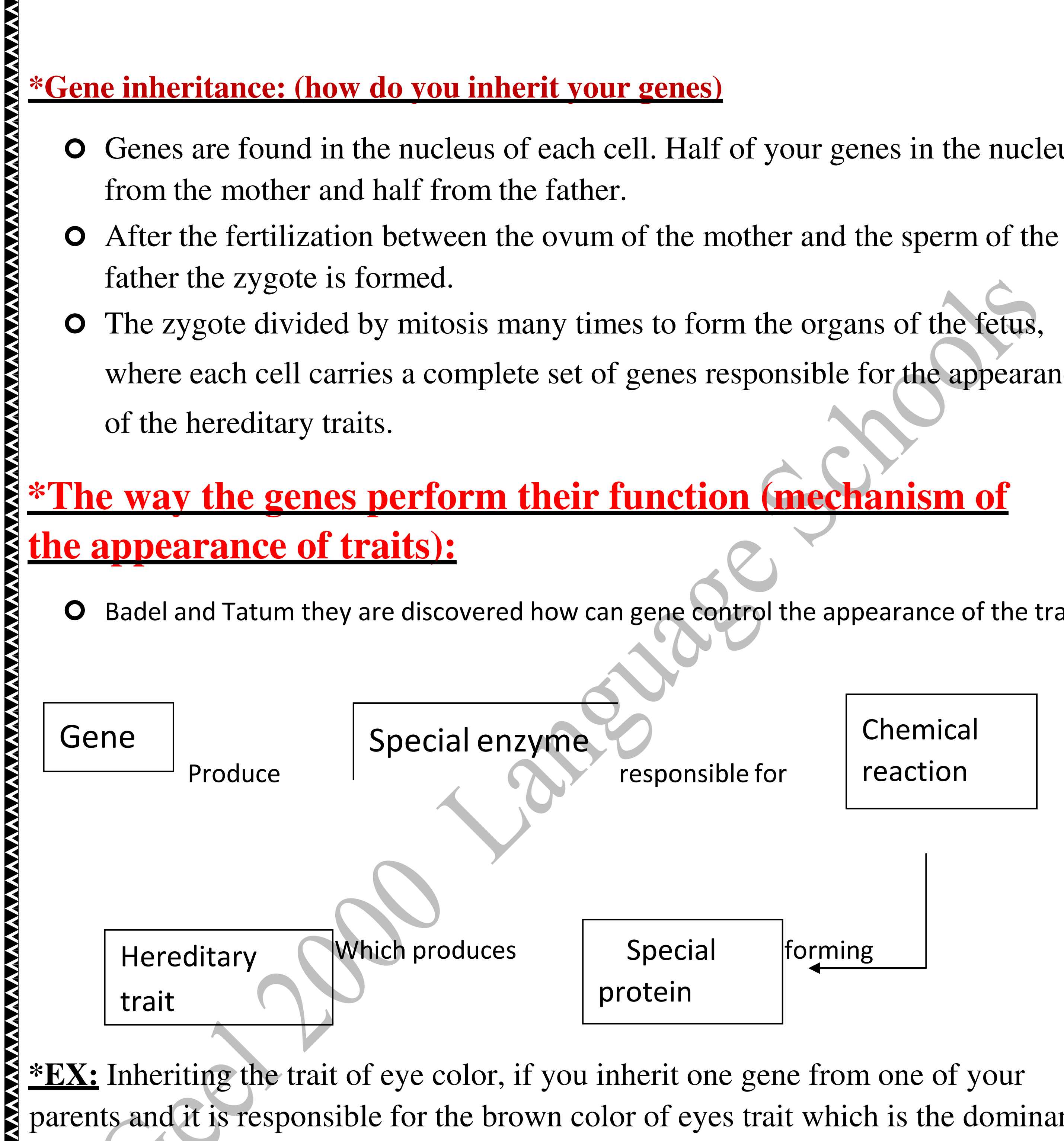
DNA parts present in the chromosomes and carry the hereditary traits of the living organisms.



***Watson and Creek model for DNA molecule:**

- This model consists of two strands coiled around each other like the spiral ladder and called double helix.
- The side of this ladder are consists of sugar molecules and phosphate group and the steps are nitrogenous bases.

- **The gene is the nucleic acid DNA building block, and consists of smallerblocks called nucleotides.**



*Gene inheritance: (how do you inherit your genes)

- Genes are found in the nucleus of each cell. Half of your genes in the nucleus from the mother and half from the father.
- After the fertilization between the ovum of the mother and the sperm of the father the zygote is formed.
- The zygote divided by mitosis many times to form the organs of the fetus, where each cell carries a complete set of genes responsible for the appearance of the hereditary traits.

*The way the genes perform their function (mechanism of the appearance of traits):

- Badel and Tatum they are discovered how can gene control the appearance of the trait.

Gene → Produce → Special enzyme → responsible for → Chemical reaction → forming → Special protein → Which produces → Hereditary trait

EX: Inheriting the trait of eye color, if you inherit one gene from one of your parents and it is responsible for the brown color of eyes trait which is the dominant trait, then the gene forms an enzyme which is responsible for chemical reaction which works on forming a protein where this trait appears on you.

***Science technology:**

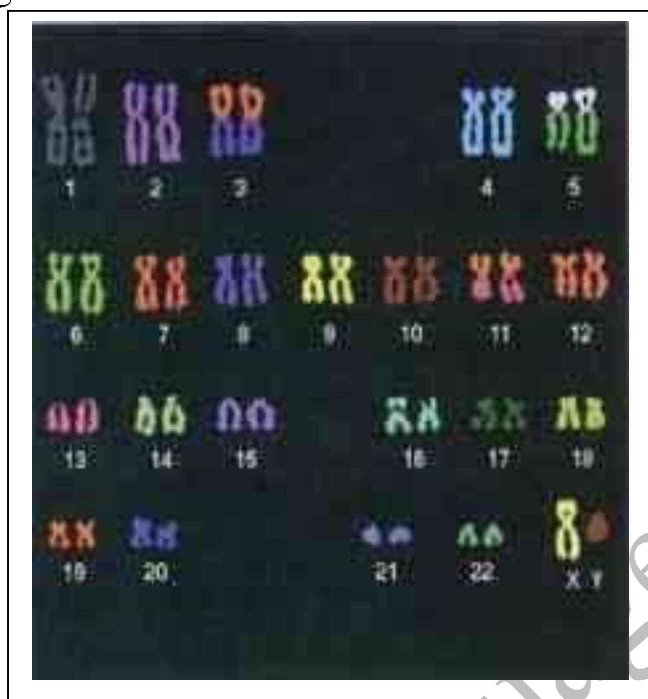
1. **Gene therapy:**
   - Replace the damaged genes which responsible for the disease with a healthy one to treat this disease, or introduce healthy genes that carrying desirable traits to the cell and the gene in this case is considered as a medicine.
2. About 500,000 people lose their sight every year due to the deficiency of vitamin A (causing malnutrition). This is due to depend on eating rice. Because rice doesn't contain carotene which is converted into vitamin (A)in the body.
   Solving this problem is by producing rice with pro-vitamin(A) by changing the genetic structure.

The Human Genome project:

- Started in October 1990 with the aim of discovering all of the humane inheriting factors (genes). The project aims to discover and determine the complete sequence of all the 3 billion pairs of nitrogenous bases. Scientists called the 21th century " The hereditary century " due to the importance of this discovery.
- Scientists decided to work hard to obtain detailed map for the sequence of the nitrogenous bases, and by drawing this map it will help in understanding the human biology and identify the single differences in the genome between one person and another.

- These single differences affect to a great extend the acceptance of the individual to the harmful environmental effects like bacteria, viruses, poisons, chemicals, medicines and various treatments.
- By these maps we could be able to know genes responsible for the various diseases like cancer, diabetes, vascular diseases, mental diseases

and to identify the various hereditary functions to the human. This project also interested in the effect of various mutations on the functions of the gene.



Human chromosomes

Human genome:-

-it is a genetic map that shows the complete set of genes that are present on the human chromosome

Unit 3 Revision

Q.(1): Put (√) or (X) and correct the wrong statements:

1. **The acquired traits are transmitted from generation to another. (   )**
2. **The mutations that occur in the reproductive cells is transmitted to offspring(   )**
3. **The ability to turn the tongue in a tube shape is a dominant trait in human.(**
4. **Mendel made a model for DNA structure. (   )**

Q.(2): Mendel placed a group of assumptions to explain the appearance of the dominant traits and the disappearance of the recessive traits in the first generation in the experiments that he carried with the pea plant. Explain these assumptions.

Q.(3): Explain the following:

1. **An experiment to explain the law of independent assortment of the hereditaryfactors.**
2. **The model of Watson and Creek of the DNA structure.**
3. **How the genes perform their functions.**
4. **Mendel chose the pea plant in conducting his experiments.**
5. **When you pollinate a pure tall stem pea plant with a short stem pea plant, itwill produce plants all are tall stems.**
6. **The free ear lobe is dominant over the attached ear lobe**

Q.(4):What's meant by:

1. Gene

2. Mendel's first law.

3. Nucleotide.

Q. (5): Give reasons:

1. Learn to walk in children is not considered a genetic trait.
2. Mendel covered the stigma of pea plant during the study of hereditary traits.
3. Mendel removed the stamens of the flowers of pea plant in his experiment.

Q.(6): Compare between:

1. The dominant traits and the recessive ones with examples.
2. The inherited traits and the acquired traits.

Q.(7):State the contribution of the following scientists

1. Mendel
2. Watson and Creek.
3. Babel and Tatum.

Q.(8): Write the scientific terms:

1-It is chemically consists of a nucleic acid called DNA combined with protein. (……………………………………….)

2- They are part of DNA on the chromosomes and control the hereditary traits of the individual. (…………………………..)

3- A structure composed of pentose sugar, a phosphate group and a nitrogenous base. (……………………………………….)

4- When two homozygous individuals differing in one pair of contrasting characters are crossed, only the dominant trait appear in the first generation and the two traits appear in the second generation by the ratio 3:1. (……………………………………)

5- Characters through which the hereditary traits are transmitted from parents to offspring. (……………………………………)

6- Characters that not transmitted from one generation to another. (…………………………………….)

Unit (4) Hormones

Hormones in the human Body

Nervous system organizes and coordinates both the activities and functions ofthe organs of living organisms.

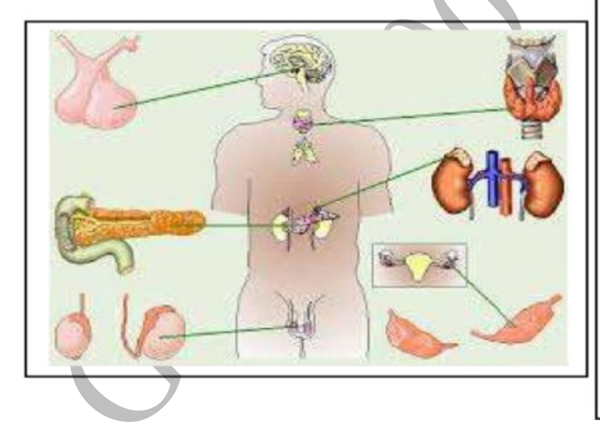
Hormones:
Chemical substances or chemical messages that control and organize most of the vital activities and functions in the bodies of living organisms.

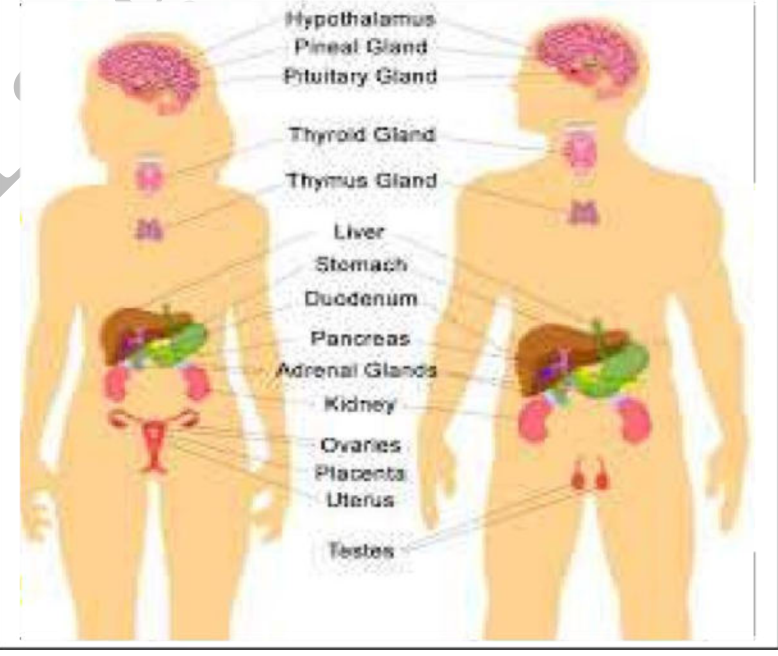
***Endocrine Glands:**

- They are special organs that secret the hormones directly into the blood stream without ducts, so they are called ductless glands.
- These glands secret more than 50 hormones in the human body.
- Cells that the hormones affect are almost located away from the endocrine gland that secrets them. So the blood is the only way for hormones to reach the target cell (Location of action).

***The Most Important Endocrine Gland in the Human Body:**

1. Pituitary gland.
2. Thyroid gland.
3. Pancreas.
4. Two adrenal glands.
5. Sexual glands (ovaries and testes).





Target cells:-

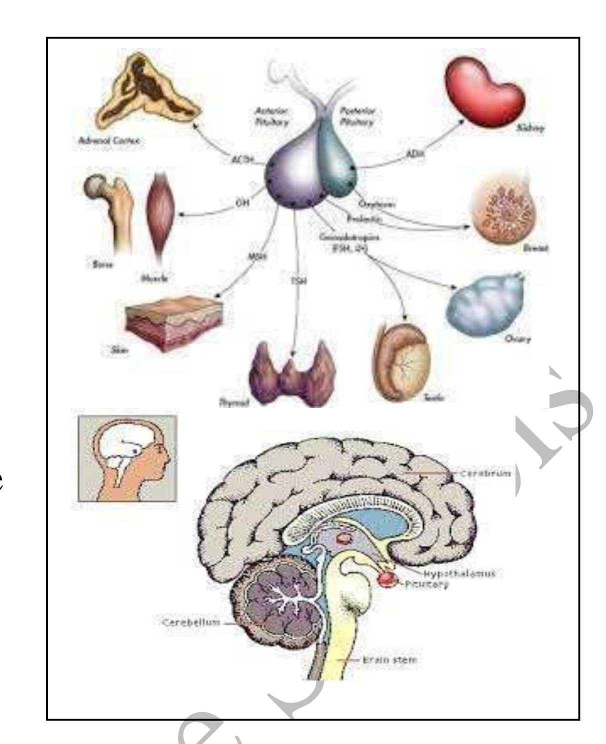
Cells that the hormones affect and they are almost located away

from endocrine gland that secrete the hormone .

Hormone disorder:-

It is increase or decrease in the secretion of one of the hormone as a result of a disorder in the action of the endocrine gland responsible forits abnormality.

1 Pituitary Gland:



- ***Location:***
  Small gland in the size of a pea below the brain.

  Function:
  It is called **master gland or main gland** because it secretes hormones that regulates the activities of most the endocrine glands. It consists of two lobes each one secrets various types of hormones.
- ***EX:***

  1. Growth hormones:
  Control the speed rate of the growth of your muscles, bones and other organs of your body. This hormone determines the height that you will reach when you become a grown up person.

  2-Mammary gland activiating hormones :
  (to secrete milk during breast feeding process)

  3-Thyroid simulating hormones (TSH):-

  4-Activating hormomes of sexual gland (two tests and two ovaries).
  (regulate the growth and the development of sex organs)

  5-Regulating water hormones in the body.

  6- Facilitating hormones during delivery.

  7- Adrenal glands activating hormones.

1. Growth hormones:

Control the speed rate of the growth of your muscles, bones and other organs of your body. This hormone determines the height that you will reach when you become a grown up person.

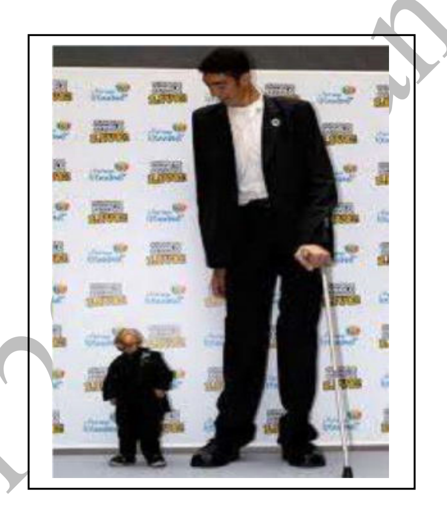
Disorder of growth hormones secretion

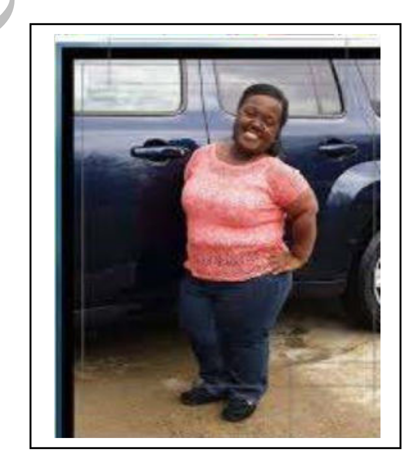
1. Dwarfism: -

   It is caused by the decreasing in growth hormone secretion at childhood. The body stops growing so the person becomes dwarf.

2. Gigantism:-

   It's caused by the increasing in growth hormones secretion at childhood The person becomes a giant **due to** continuous growth in the limb's bones.

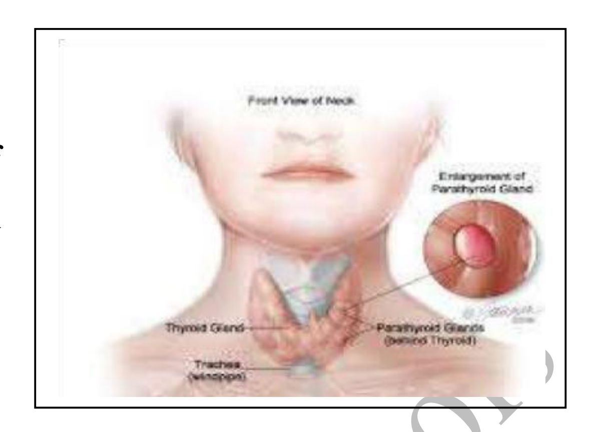




❷ Thyroid Gland:

- ***Location:***

  Two lobes located in the front surface of the neck on both sides of the trachea and linked together by a small part.



- ***Function:***
  - ✞ Secrete ***thyroxin*** which plays a main role in food assimilation processes in the body. It liberates the necessary energy of the human body from food.
  - ✞ It also secrets ***Calcitonin*** which control the level of calcium in the blood.

- ***Diseases:***

  Simple goiter

  Enlargement of the thyroid gland and neck due to decreasing in the secretion of thyroxin due to the lack of iodine in food as it enters in the hormone's structure.

  Exophthalmic goiter:

  Enlargement of the thyroid gland and neck accompanied by loss of weight tension and exophthalmoses due to increase in the secretion of the thyroxin hormone in large amount.

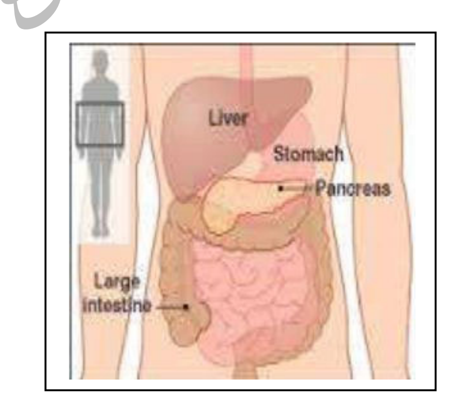
Give reason

The food must contain iodine.

Because iodine enters in the structure of thyroxin hormone which plays a main role in food assimilation processes in the body

❸ Pancreas gland:

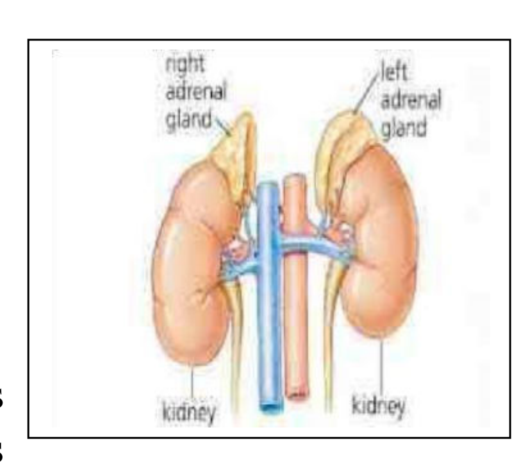
- ***Location:***
  located between the stomach and the small intestine.
- ***Functions:*** it secretes two hormones
  1. **Insulin hormone:**
     Help in glucose sugar transporting from blood to all blood cell in the aim of releasing energy. So this hormone reduces the level of sugar in blood.
  2. **Glucagon hormone:**
     Its function contradicts the function of insulin. It raises the level of sugar in the blood through stimulating the liver to convert the stored glycogen into glucose and release it in the bloodstream to be available to the body's cells.



- ***Diseases***

Diabetes: feeling thirsty and multiple urination times. It is due to the decreasing in the secretion of insulin hormone, which leads to increasing of the level of glucose sugar.

❹ Adrenal glands:



- ***Location:***
  Two glands one on each kidney.
- ***Function:***
  Secretion of **Adrenalin** which stimulates body's organs to response to emergencies as fear ,anger and emotion.

5-Reproductive glands

- **two Ovaries:**

- ***Function:(as endocrine gland)*** :- they secrete two hormones
  1. **Estrogen hormone:** appearance of secondary sex characteristics.
  2. **Progesterone hormone:** promotes the growth of endometrium (the lining of the uterus).

- **The two Testes:**

- ***Function: (as endocrine gland)***
  Secretion of **testosterone** which responsible for the appearance of secondary sexual characteristics of puberty.

**Science Technology:*

✞ Scientists treated some of the dwarfism cases by injecting the human growth hormone extracted from newly dead corpses in the children's bodies whose pituitary gland don't secret enough amount of growth hormones, but the amounts of growth hormone that they could get is very small and not enough in addition to the possibility of containing some microbes that may cause infection by various diseases.

✞ Scientists succeeded in 1979 in producing sufficient amount of growth hormone by genetic engineering technology. They inserted humane gene - which responsible for the formation of growth hormone – into bacterial cell to reproduce great amount of it. This hormone succeeded to treat children of limited growth.

Give reason:-

*pancreas is mixed gland.

Because the pancreas acts as ductless gland which secretes the insulin and glucagon hormones that regulates the glucose sugar level in the blood and it also secretes digestive juices that help in digestion process through a duct.

*pancreas is double function gland.

Because the pancreas secretes the insulin hormone and the glucagon hormone and the function of each hormone contradict the function of the other.

*The female vocal cords produce voices more than those produced by male ones .

Because the sexual hormones in the mature male body cause an increase in the thickness of vocal cords , so the thin vocal cords in a female's larynx vibrate faster than the thick cords in the male's larynx.

Unit ❹ Revision

Q.(1): Choose:

1. The ………………… Hormone liberates the needed energy from the food stuff.

   (growth - Estrogen - thyroxin)

2. The hormone responsible for the appearance of secondary sexual male characteristics isthe…………………hormone.

   (progesterone - testosterone - adrenalin)

3. The hormone which stimulates body organs to respond for emergencies is …………………

   (glucagon - adrenalin - estrogen)

4. The hormone which responsible for the appearance of the female secondary sexualcharacteristics is ……………………… .

   (testosterone - insulin - estrogen)

5. The hormone which its deficiency causes the enlargement of thyroid gland is ……………

   (glucagon - thyroxin - insulin)

6. The hormone which stimulates the storage of glucose sugar in liver is the………………… (insulin - parathormone - thyroxin)

7. The hormone which regulates the level of calcium in blood is the……………………………(adrenalin - progesterone - calcitonin)

Q.(2): Give Reason for:

1. The height of some persons reaches more than 2 meters.
2. The height of some persons reaches less than half a meter.
3. Diabetes disease is treated by insulin hormone.
4. Pancreas is double function gland.

5. Pituitary gland is called the master gland.
6. Thyroid gland plays an important role in controlling the level of calcium in theblood.
7. The two adrenal glands have an important role when man exposed to emergency.

Q.(3): Complete:

1- .... is a gland which releases its secretions into the blood stream directly without ducts.

2. When the amount of glucose sugar decreases in the blood, pancreas secretes.............................. hormone.
3. A chemical substances that control the functions of the most of body organs is known as....................................
4. When the amount of iodine decreases in the food, the secretion of the ....hormone decreases from ....gland.
5. The .... hormone is secreted in the blood when the rate of glucose sugar increases in the blood.
6. The deficiency of .... hormone secretion during .... stage causes dwarfism.
7. Deficiency of insulin hormone secretions causes ....

Q.(4) : Compare between:

1- The two testes and the two ovaries in concern of their hormones.

2- The pituitary gland and thyroid gland.

3- Simple goiter and exophthalmic goiter.

Q.(5): What will happen when:

1- Deficiency of the growth hormone in childhood.

2- Increasing in growth hormone in childhood.

3- Deficiency of insulin hormone secretion.

4- Increasing of the secretion of the thyroxin hormone with large amounts.

5- Decreasing in the iodine amount in the blood.

Q.(6): What's meant by:

1- Hormone.

2- Endocrine gland.

3- Diabetes.

4- Simple goiter.